APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/553,956	04/21/2000	Thomas A. Runkler	50277-452	7423

7590 12/31/2003	EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _30 September 2003_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-8,10,12-25,27 and 29-34_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration. ·

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-6,10,12-14,16-23,27,29-31,33 and 34_ is/are rejected.

7)☒ Claim(s) _7,8,15,24,25 and 32_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
since a specific reference was included in the first sentence of the specification or in an Application Data Sheet.
37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific
reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)   4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)   5) ☐ Notice of Informal Patent Application (PTO-152)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .   6) ☐ Other: .

DETAILED ACTION

1.   Applicants filed an Appeal Brief on 09/30/2003. Applicants' argument has

been carefully considered by an appeal conference. The panel agreed with the

applicants that the method and computer readable medium bearing instruction of Hall

does not teach all the limitations of the claims 1, 10, 17-18, 27 and 34. Thus, the finality

of the office action 03/25/2003 is withdrawn. The office regrets for any inconvenience

may cause due to the action. The pending claims are 1-8, 10, 12-25, 27 and 29-34.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35

U.S.C. 102 that form the basis for the rejections under this section made in this Office

action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the
> United States before the invention thereof by the applicant for patent, or on an international application
> by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this
> title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act

of 1999 (AIPA) and the Intellectual Property and High Technology Technical

Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting

directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior

to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3.   **Claims 1-3, 10, 16, 18-20, 27 and 33 are rejected under 35**

U.S.C. 102(e) as being anticipated by Rastogi et al. [USP 6,247,016 B1].

Regarding to claims 1 and 18, Rastogi teaches a method and a computer

readable medium bearing instruction for classifying data using a decision tree. As

shown in FIG. 1, there is a single record corresponding to each loan request,

characterized two attributes, salary and education level completed (Col. 2, lines 50-56).

As shown in FIG. 2, `salary` is selected *from among the features characterizing the data*

associated with the root node, and the test `is the salary level of the`

`applicant less than $20,000.00` (Col. 2, lines 62-63) is to split the root node N

into N_1 and N_2 (FIG. 3, line 8). The test is based on the process of calculation of the

least entropy by scanning the attribute list from the beginning to calculate an entropy for

each split point or each numeric attribute in order to determine the least entropy (Col. 4,

lines 25-52). In short, the technique as discussed indicates the steps of *selecting a*

feature from among the features characterizing the data associated with the node, and the

process of determining the least entropy as *performing a cluster analysis along the*

selected feature to group the data into one or more cluster. The left arc that connects the

root node to node 30 is labeled `YES` indicating that node 30 is to be reached if the

`salary < $20,000`. On the other hand, the right arc connects root node to another

branch node is labeled `NO` indicating the branch node is to be reached if `salary >`

`$20,000`. The branch node is labeled `ACCEPT` (FIG. 2). This performs the claimed

constructing one or more arcs of the decision tree at the node respectively for each of the one

or more clusters. As in FIG. 1, the first applicant has a salary of $15,000. Thus, at root

node 10, the condition yields a *YES*, the attributes of this first applicant are passed on to

the left branch, where an additional test takes place. If the condition resulted in a *NO*

answer, the attribute of this applicant would have been passed to the right branch and

leaf 20 would have been formed, classifying this applicant in the class of applicants

whose loan request is accepted (Col. 3, lines 46-58). As seen, the attributes of first

record are passed to the left branch to node 30 characterized by *Education* feature for

another test, and the attributes of second record are passed to the right branch to node

20 characterized by *ACCEPT* attribute as the step of *projecting the data in each of the*

clusters, wherein the projected data are characterized by the plurality of the features but for

the selected feature. As shown in FIG. 3 is the procedure to build the decision tree. A loop

is set up at line 3, the root node is queued at line 2 and de-queued at line 4, root node is

split into nodes 30 and 20 at line 8, appended to the queue at line 9 (FIG. 3). The

procedure is recursively performed on node 30 at line 3 with another process of

calculation of the least entropy and another test for *Education* as the selected and

projected feature (Col. 3, lines 5-9). As seen, the procedure of building decision tree

with a loop as discussed indicates the step of *recursively performing the steps of selecting*

a feature and performing the cluster analysis on the projected data in each of the cluster.

Regarding to claims 2 and 19, Rastogi teaches all the claimed subject matters as

discussed in claims 1 and 18, Rastogi further discloses the steps of *performing a*

plurality of cluster analyses along each of the features to calculate a maximal cluster validity

measure, said maximal cluster validity measure corresponding to one of the features; and

selecting the one of the features that corresponds to the maximal cluster validity measure (Col.

4, lines 25-52).

Regarding to claims 3 and 20, Rastogi teaches all the claimed subject matters as

discussed in claims 2 and 19, Rastogi further discloses the step: *for each of the features,*

performing a plurality of cluster analyses along said each of the features for a plurality of

cluster numbers to calculate respective partition coefficients; and determining the maximal

cluster validity measure from among the partition coefficients (Col. 4, lines 25-52).

Regarding to claims 10 and 27, Rastogi teaches a method and a computer

readable medium bearing instruction for classifying data using a decision tree. As

shown in FIG. 1, there is a single record corresponding to each loan request,

characterized two attributes, salary and education level completed (Col. 2, lines 50-56).

As shown in FIG. 2, `salary` is selected for the root node with the test `is the`

`salary level of the applicant less than $20,000.00` (Col. 2, lines 62-

63) to split the root node N into N_1 and N_2 (FIG. 3, line 8). The test is based on the

process of determining the least entropy by calculating the entropy E (S_1), E (S_2) and E

(S_1, S_2) for each split point corresponding to a numeric attribute or categorical attribute.

The split with the least entropy best separates classes, and is chosen as the best split

for a node (Col. 4, lines 25-52). As seen, the calculation of E (S_1), E (S_2) and E (S_1, S_2)

as *a plurality of cluster analyses along each of the* numeric or categorical *features to*

calculate the entropy of each split point as *partition coefficients* to determine the least

entropy that best separates classes and corresponds to one of the features as *maximal*

cluster validity measure. In other words, the technique as discussed performs the steps of

performing a plurality of cluster analysis along the selected feature to calculate a maximal

cluster validity measure, said maximal cluster validity measure corresponding to one of the

features, wherein the step of performing the cluster analyses along each of the features to

calculate a maximal cluster validity measure includes the performing the steps of: for each of

the features, performing a plurality of cluster analyses along said each of the features for a

plurality of cluster numbers to calculate respective partition coefficients; and determining the

maximal cluster validity measure from among the partition coefficients. FIG. 3 is the

procedure of building a decision tree, after the step of evaluating the entropy as in FIG.

3, line 7, the numerical or categorical attribute corresponds to the least entropy is used

to split node N into N_1 and N_2 at line 8 by the test `is the salary level of the`

`applicant less than $20,000.00` as in FIG. 2 (Col. 2, lines 62-63) as the steps

of *selecting the one of the features corresponding to the maximal cluster validity measure;*

subdividing the data into one or more groups based on the selected feature, and *the decision*

tree is built based on N_1 and N_2 as *one or more groups*.

Regarding to claims 16 and 33, Rastogi teaches all the claim subject matters as

discussed in claims 10 and 27, Rastogi further discloses the steps of *projecting the data*

in each of the group, wherein the projected data are characterized by the plurality of the

features but for the selected feature; and recursively performing the steps of selecting a

feature, comprising selecting a new one of the features corresponding to a new maximal

partition coefficient and subdividing the data into one or more new groups based on the

selected new feature (FIG. 3, Col. 3, lines 46-58).

4.   Claims 17 and 34 are rejected under 35 U.S.C. 102(e) as being

anticipated by Applicant Admitted Prior Art [Background Of The Invention, pages

1-5].

Regarding to claims 17 and 34, Applicant Admitted Prior Art discloses a method

for generating a decision tree for a plurality of data. As disclosed by Applicant Admitted

Prior Art, FID3 generates its decision tree by maximizing information gains. The

decision of the fuzzy decision tree is also a fuzzy variable, indicating the memberships

of a tested object in each of the possible classifications (page 4, lines 13-15). Rather

than categorize a patient's age as "twelve years and below" and "above twelve years,"

two fuzzy sets, $Young$ and Old, can be employed, such that a two-year old may have a

membership function in the $Young$ fuzzy set μ_{young} (2) = 0.99 but a membership

function in the Old fuzzy set μ_{old} (2) = 0.01 (page 4, lines 1-5). A branch node is

created and the attribute with the highest information gain is selected if that attribute

were used to discriminate objects at the branch node (page 3, lines 15-16). For

example, arc 512 could be the test μ_{young} (X$_i$) < 0.5 or other value that maximizes the

information gain. As seen, μ_{young} (X$_i$) and μ_{old} (X$_i$) as a plurality of fuzzy cluster

analyses is performed along each of the age features to calculate the highest

information gain corresponding to one of the features as *maximal partition coefficient* and

for two fuzzy sets Young and Old, then the attribute with the highest information gain is

selected to discriminate objects at the branch node to build the decision tree based on

two fuzzy sets Young and Old. In other words, the admission performs the claimed

performing a plurality of fuzzy cluster analysis along each of the features to calculate a

maximal partition coefficient and a corresponding set of one or more fuzzy clusters, said

maximal partition coefficient corresponding to one of the features; selecting the one of the

features corresponding to the maximal partition coefficient; building the decision tree based

on the corresponding set of one or more fuzzy clusters.

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of

the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g)

prior art under 35 U.S.C. 103(a).

6.   **Claims 4, 12, 21 and 29 are rejected under 35 U.S.C. 103(a) as being**

unpatentable over Rastogi et al. [USP 6,247,016 B1] in view of Applicant Admitted

Prior Art [Background Of The Invention, pages 1-5].

Regarding to claims 4, 12, 21 and 29, Rastogi teaches all the claimed subject

matters as discussed in claims 1 and 18, but fails to disclose the step of *performing the*

cluster analysis includes the step of performing a fuzzy cluster analysis. Applicant Admitted

Prior Art teaches the technique of using fuzzy cluster analysis for a decision tree (page

4, lines 1-5). Therefore, it would have been obvious for one of ordinary skill in the art at

the time the invention was made to modify the Rastogi method by using fuzzy cluster

analysis for a decision tree as taught in the admission in order to calculate the

maximizing information gains.

7.   **Claims 5 and 22 are rejected under 35 U.S.C. 103(a) as being**

unpatentable over Rastogi et al. [USP 6,247,016 B1] in view of Applicant Admitted

Prior Art [Background Of The Invention, pages 1-5] and Hall et al. [Generating

Fuzzy Rules from Data].

Regarding to claims 5 and 22, Rastogi and Applicant Admitted Prior Art teaches all the claimed subject matters as discussed in claims 4 and 21, but fails discloses the step of *performing the fuzzy cluster analysis includes the step of performing a fuzzy c-means analysis*. Hall teaches the technique of using fuzzy c-means for a decision tree (Hall, Generating Fuzzy Rules from Data). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the Rastogi and Applicant Admitted Prior Art method by including the technique of using fuzzy c-means in order to determine the number of cluster.

8.   **Claims 13 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rastogi et al. [USP 6,247,016 B1] in view of Hall et al. [Generating Fuzzy Rules from Data].**

Regarding to claims 13 and 30, Rastogi teaches all the claimed subject matters as discussed in claims 10 and 27, but fails discloses the step of *performing the fuzzy cluster analysis includes the step of performing a fuzzy c-means analysis*. Hall teaches the technique of using fuzzy c-means for a decision tree (Hall, Generating Fuzzy Rules from Data). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the Rastogi and Applicant Admitted Prior Art method by including the technique of using fuzzy c-means in order to determine the number of cluster.

9.   **Claims 6, 14, 23 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rastogi et al. [USP 6,247,016 B1] in view of Shafer et al. [SPRINT: A Scalable Parallel Classifier for Data Mining].**

Regarding to claims 6, 14, 23 and 31, Rastogi teaches all the claimed subject matters as discussed in claims 1, 10, 18 and 27, but fails to disclose the step of *performing the cluster analysis includes the step of performing a hard cluster analysis*. Shafer teaches a method of forming a decision tree by performing a hard cluster analysis (Shafer, SPRINT: A scalable Parallel Classifier for Data Mining, pages 544-550, especially Abstract and Introduction pages 544-545). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the Rastogi method by including the technique of hard cluster analysis in order to optimize the system by using a regular cluster for classifying records of unknown class.

Allowable Subject Matter

10.   **Claims 7-8, 15, 24-25 and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.**

Regarding to claims 7-8, 15, 24-25 and 32, the closet available prior arts, USP 6,247,016 B1, issued to Rastogi also teaches the technique of refining a node of a decision tree. However, as in claims 7, 15, 24 and 32, Rastogi fails to teach or suggest

the steps of *calculating a domain ratio of a difference in domains limits of the data over a*

difference in domain limits of a superset of the data; determining whether the domain ratio

has a predetermined relationship with a predetermined threshold; and if the domain ratio has

the predetermined relationship with the predetermined threshold, then grouping the data into

a single cluster. Therefore, the invention is allowable over the prior arts of record for

being directed to a combination of claimed elements including the providing steps as

indicated above.

Conclusion

11.   Any inquiry concerning this communication or earlier communications from

the examiner should be directed to HUNG Q PHAM whose telephone number is 703-

605-4242. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, JOHN E BREENE can be reached on 703-305-9790. The fax phone

number for the organization where this application or proceeding is assigned is (703)

872-9306.

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the receptionist whose telephone number is 703-305-

3900.

Examiner Hung Pham
December 17, 2003

SHAHID ALAM
PRIMARY EXAMINER